Index

Bold type is used for contributors to this volume. The suffix e indicates editorial comment; c, a conference report; r, a book review. Abbreviations: fr, fibre-reinforced; grc, glass-reinforced cement; lw, lightweight; pfa, pulverised fuel ash.

Aardelite, 160-7 accelerated tests

ageing of pfa/grc composites, 6-8, 9 pfa coarse aggregate concrete, 166-7 sulphate attack of asbestos cement pipes, 170, 171

acrylic resins, 219, 221

adhesion, see shear bond strength adhesives, polymeric, 219-20 (see also epoxy resins)

ageing

casting delay, 109-13 effect on strength of copper fr cement, 195, 196 epoxy resins, 236 pfa/grc composites, 5, 7-9 aggregates

coarse pfa, 159-67 recycled, 271-2r

Al-Adeeb, A. and Matti, 'Sulphate attack on asbestos cement pipes', 169-76

Altofts canal bridge, 230, 231 asbestos cement pipes sulphate attack, 169-76 ASTM Standards, 62r axial stress in ferrocement, 151-7

bamboo fr concrete, 139r

Barr, B.I.G., Liu and Watkins, 'Mode II fracture of reinforced concrete materials', 93-101

beams

model for fracture under in-plane shear, 39-47 natural fr concrete, 11-19 torsional behaviour of reinforced concrete, 261-7

bending strength pfa/grc composites, 5, 6-9

bending stress in ferrocement, 151-7

Bentur, A., Mindess and Diamond, 'Pull-out processes in steel fibre reinforced cement', 29-37

Bijen, J. M. J. M. and van der Wegen, 'Properties of concrete made with three types of artificial PFA coarse aggregates', 159-67

Birmingham University Mining and Metallurgy Department, 234, 237 Blackburn road viaduct, 228, 230 blending of polymer concrete, 50-2 bolted joints with epoxy resin adhesives, 222, 227, 235, 239, 257

bond strength oil-saturated concrete, 117-30 steel fibres, 86-7 tests, 115-16

bonding

characteristics of oil-saturated concrete, 115-30 in cellulose fr cement, 73-9 interpretation of pull-out tests in steel fr cement, 29-30 maximum shear stress in fibre-matrix bond, 79-80

book reviews, 59-62r, 137-40r, 206-7r, 271-4r

bridges

repair with epoxy resins, 228-31 repair with styrene-butadiene latex concrete, 241-6 segmental construction using epoxy resins, 221, 225-9, 230, 257-8

Brinsworth railway bridge, 228, 230 **British Standards**

test methods for resin compositions, 249-52

Bruhwiler, E., 'Effect of compressive loads on the tensile strength of concrete at high strain rates', 103-108

building boards glass fr cement based, 1e, 3-10

Building Codes reinforced concrete, 60r structural plain concrete, 60r thermosetting plastics, 231

calcium aluminosulphates, 7-8, 170, 173

calcium hydroxide (lime), 8-10, 170 Cambridge University New Museums Laboratories, 235, 239

carbonation of pfa/grc composites, 8-10

casting process

effect of delay on workability and strength, 109-13 effect of direction on stress-strain curves 87-8, 91-2

cement composites bonding in cellulose fr, 73-9 compacted copper fr, 193-7 fracture mechanics, 134-5c

glass fr, with added pfa, 3-10 hydraulic, 58r pull-out processes in steel fr. 29-37 very high strength, 134-5c cement slurry as retempering agent,

177-82 chemical resistance

epoxy resins, 259-60 polymer concrete, 231

resin composition standard, 251, 252

China, 268-70c

Choisy-le-Roi bridge, 225-6

coarse aggregates, pfa, 160-2 concrete containing, 159, 162-7, 215e

colour incorporation in polymer concrete, 52-3

compaction methods for polymer concrete, 52-3, 57

compression tests

compact, 99

inelastic deformation behaviour, 81-

steel fr and stirrup reinforced concrete, 183-92

compressive strength

artificial pfa coarse aggregate concrete, 162-4 effect of casting delay, 112-13 latex modified concrete, 243 MOTEMA-acrylic concrete, 57

reinforced concrete columns, 186-92 resin composition standard, 250, 251,

steel fr concrete under high strain rates, 21-7, 28 untempered plain and superplasti-

cised concrete, 178, 180-2 compressive toughness steel fr concrete, 90-2

conferences and symposia forthcoming, 63-8c, 141-7c, 208-14c, 275-80c, 282c

reports, 133c, 203-5c, 268-70c

construction techniques

current practice for concrete materials, 61-2r in tropical developing countries, 137r

latex modified concrete, 244-6 with resins, 217-22, 225-31, 233-9

copper fr cement composite, 193-7 corrosion

permeability of chloride latex modified concrete, 243, 245 protection with epoxy coatings, 228,

steel fr concrete and shotcrete, 149– 50e sulphate attack of asbestos cement

pipes, 169–76

Coutts, R. S. P., Morrissey and Grossman, 'Bond between cellulose fibres and cement', 73–80

Coventry Cathedral, 234-5, 237 cracking

courses, 69, 148, 214, 281

asbestos cement pipes, 170, 171, 173, 175

at an early age, 199–201 at high strain rates, 106–8

ferrocement under combined axial and bending stress, 153–4

latex modified concrete, 242–3 modes, 39–40, 93–4

MOTEMA-acrylic concrete, 55–6 sisal twine reinforced concrete beams, 12–13, 14, 16, 17 steel fr cement paste in pull-out tests, 29–30, 31–7

steel fr reinforced concrete beams under torsion, 263-4, 265-6

crane rail supports, 221–2, 258 creep

artificial pfa coarse aggregate concrete, 166

MOTEMA-acrylic concrete, 55, 56 resin composition standard, 250, 251

cryogenic conditions, 215e, 273r curing

epoxy resins, 253 latex modified concrete, 243, 245–6 methods for concrete, 207r

deformation, see stress-strain characteristics

deformation energy

reinforced concrete columns under compression, 186–7, 188 steel fr concrete under high strain rates, 26–7, 28

density

resin composition standard, 250, 251 design

current practice for concrete materials, 61-2r, 271r

grc, 268c

hazard protection, 61r reinforced concrete slabs, 59-60r

design life, see durability developing countries, 1e, 137r

Diamond, S., Bentur and Mindess, 'Pull-out processes in steel fibre reinforced cement', 29–37

Diaz, G., Kittl and Galleguillos, 'Properties of compacted copper fibre reinforced cement composite', 193–7 drying shrinkage, see shrinkage ductility

reinforced concrete under compression, 183, 186–7 steel fr reinforced concrete beams,

durability

261, 267

aggregates in concrete, 161 asbestos cement pipes, 169–76 building materials and components, 133–4c, 272–3r

concrete cracked at an early age, 199-201

design life of epoxy resin joints, 236, 259

latex modified concrete, 243–4 natural fr concrete beams, 19 pfa coarse aggregate concrete, 166–7 related to design, 71e, 139–40

earthquakes, 272r, 273-4r elasticity modulus

latex modified concrete, 243, 244 resin composition standard, 250, 251

epoxy resins, 218, 220 bridge construction, 221, 225–7, 228, 230

mortar and concrete applications, 253–9

repairs, 221–2, 227–31 structural applications, 233–9

test methods 249–52 ettringite, 7–8, 170, 173, 176 Evode offices, Stafford, 235, 239

Exeter University science buildings, 234, 236, 238

expansion

asbestos cement pipes, 171, 172, 175

pfa coarse aggregate concrete, 164–5 expansive cements, 60–1r

failure (see also fracture behaviour) cellulose fr cement, 74–9 ferrocement under combined bending and axial stress, 153–7 in-plane shear of short beam, 44–6 oil-saturated concrete, 117 plain concrete at high strain rates, 104–108 reinforced concrete columns under compression, 185 steel fr reinforced concrete beams

under torsion, 265–6

Faiyadh, F. I., 'Bond characteristics of oil-saturated concrete', 115–31

ferrocement, 135–6c, 138r, 214 iron/MOTEMA-acrylic concrete, 56, 57

under combined bending and axial loads, 151-7

fibre content

effect on copper fr cement, 194–7 effect on torsional strength of reinforced beams, 261, 264–7

fibre pull-out

failure mechanism in cellulose fr cement, 74–9 steel fr cement, 29–37

fibre-reinforced composites, 206r, 207r, 268r, 282c

fibre reinforcement, 59r, 138–9r maximum shear stress in bond to matrix, 79–80 strengthening of twine reinforced

concrete, 15-19

fibre shape effect on mechanical properties for steel, 89–90

effect on strength of fr composites, 22-7, 30, 31-7, 194-7

fillers

incorporation in polymer concrete, 50, 52

iron powder, 56

finite element studies of in-plane shear, 39–47, 94–6

flexural strength

asbestos cement pipes after sulphate attack, 171–3, 174

latex modified concrete, 243

MOTEMA-acrylic concrete, 56–7 resin composition standard, 250, 251, 252

sisal twine reinforced concrete

beams, 12-19 flooring

epoxy coated, 255

mosaic backed with epoxy mortar, 254, 256

resin based industrial, 220, 255, 256 fracture behaviour

failure process in cellulose fr cement, 74–5, 78–9

LEFR modelling for short beam shear, 39–46

polypropylene and steel fr concrete shear, 93–100

fracture mechanics of cement composites, 134c

fracture strength

copper fr cement, 194-7

fracture toughness

polypropylene fr concrete, 97–8, 99 short concrete beam under in-plane shear, 46

steel fr concrete, 98–100 fuel ash, see pulverised fuel ash

Galleguillos, E., Kittl and Diaz, 'Properties of compacted copper fibre reinforced cement composite', 193-7

Gartnavel General Hospital, Glasgow, 235, 239

Glasgow Airport terminal building, 234, 237

glass fr cement (grc), 1e, 268c effect of pfa addition, 3–10 glass fr concrete, 138r

Grossman, P. U. A., Morrissey and Coutts, 'Bond between cellulose fibres and cement', 73-80

grouting

epoxy resin based, 221-2, 235, 239, 258, 259

polyester based, 221–2 techniques, 206–7r

Hartwich, K. and Rostasy, 'Compressive strength and deformation of steel fibre reinforced concrete under high rate of strain', 21–8

Hatanaka, S., Kosaka and Tanigawa, 'Lateral confining stresses due to steel fibres in concrete under compression', 81–92

hazards, see under safety

hooked steel fibre reinforcement compressive strength under high rates of strain, 22–7 interpretation of pull-out tests, 30, 32,

34, 35–7, 81–7 mechanical properties, 89–90 housing systems, prefabricated, 1e

hydraulic cements, 59r

impact strength

pfa/grc composites, 5–9 inelastic deformation of concrete, 81–92

iron (see also ferrocement) incorporation with MOTEMA-acrylic concrete, 56, 57

joints bonded with epoxy resins, 220–2, 234, 235–9

Kittl, P., Galleguillos and Diaz, 'Properties of compacted copper fibre reinforced cement composite', 193–7

Koblischek, P. J., 'MOTEMA – acrylic concrete for machine tool frames', 55–7

Kosaka, Y., Tanigawa and Hatanaka, 'Lateral confining stresses due to steel fibres in concrete under compression', 81–92

Kreis, R., 'Short curing times for the polymer concrete', 49–54

Kuhlmann, L. A., 'Latex modified con-

crete for the repair and rehabilitation of bridges', 241–7

laminates, 206r

latices, polymeric, 219–20, 221–2, 241–6

lightweight concrete

marine applications, 215e

with artificial pfa aggregates, 159, 162-7

Lim, T. Y. and Mansur, 'Torsional behaviour of reinforced fibre concrete beams', 261–7

lime, free, 8-10, 170

Liu, K. L. W., Barr and Watkins, 'Mode II fracture of fibre reinforced concrete materials', 93–101

Liu, K. L. W. and Watkins, 'A finite element study of the short beam test specimen under mode II loading', 39–47

Lloyds building, London, 234, 237, 239 Lytag, 160–7

Majumdar, A. J. and Singh, 'The effect of pfa addition on the properties of grc', 3–10

Mangat, P. S. and Motamedi Azari, 'Influence of steel fibre and stirrup reinforcement on the properties of concrete in compression members', 183–92

Mansur, M. A. and Lim, 'Torsional behaviour of reinforced fibre concrete beams', 261–7

Mansur, M. A. and Paramasivam, 'Ferrocement under combined bending and axial loads', 151–8

marine applications, 215e

mass concrete pours, 207r

Matti, M. A. and Al-Adeeb, 'Sulphate attack on asbestos cement pipes', 169–76

microstructure

pfa/grc composites, 7

steel fr cement paste, 29-30, 31-7

Mindess, S., Bentur and Diamond, 'Pull-out processes in steel fibre reinforced cement', 29–37

mixing process for polymer concrete, 49-54

Mode I fracture, 99, 100

Mode II fracture

polypropylene and steel fr concrete, 93–100

short beam failure, 39-47

models, theoretical

failure in fr cements, 75-6

fracture of cement composites, 134–5c

shear fracture of short beams, 39-47

modulus of elasticity, see elasticity modulus

modulus of rupture

bending of pfa/grc composites, 5, 6, 7, 9

steel fr reinforced concrete beams, 263

Morrissey, F. E., Coutts and Grossman, 'Bond between cellulose fibres and cement', 73–80

mortars, polymer, 221, 253

Motamedi Azari, M. and Mangat, 'Influence of steel fibre and stirrup reinformcent on the properties of concrete in compression members', 183–92

MOTEMA-acrylic concrete, 55–7 motorways, see bridges, road surfacing moulds for polymer concrete, 52, 53

Mwamila, B. L. M., 'Natural twines as main reinforcement in concrete beams', 11–19

Neffgen, B., 'Epoxy resins in the building industry – 25 years of experience', 253–60

Nether Edge Hospital, Sheffield, 234, 238–9

Niro Atmizer, 160-2

O'Brien, T., 'Resins in construction: feedback from structural applications', 233–9

oil-saturated concrete, 115-30

Paramasivam, P. and Mansur, 'Ferrocement under combined bending and axial loads', 151–8

plain concrete

Building Code requirements, 60r effect of casting delay, 109–13

effect of high strain rates, 23–8, 104–108

inelastic deformation under triaxial compression, 81, 82–4

model for fracture of short beams, 39-47

retempering, 177-82

tensile strength at high strain rates under compressive loads, 103–108

compacted copper fr cement, 195–6 pfa/grc composites, 5, 6, 7 reinforced concrete, 137–8r

polyester resins, 218–19, 220, 221, 222 polymer concrete

applications, 53-4, 215e

continuous mixing and pouring process, 49-53

modified with styrene-butadiene latex, 241-6

MOTEMA-acrylic, 55–7 properties of epoxy concrete, 254 repairs with epoxy resin concrete, 222, 228, 230 polymers, 217–22 (see also epoxy

resins, polymer concrete) test methods, 249–60 polymethyl methacrylate, 50, 55 polypropylene fr concrete, 138–9r, 268c

fracture studies, 96, 97–8 polyurethane resins, 219

portland cement

matrix with added pfa, 1e, 3–10 steel fibre pull-out processes, 29–37 pot life of resin compositions, 250, 251 pozzolans, 203c (see also pulverised

precast concrete, 149e, 204–5c, 268c bridge construction, 225–7 epoxy resin adhesive techniques, 233–9

polymer, 259-60

prefabricated housing systems, 1e pull-out

bar in oil-saturated concrete, 115–30 fibre, see fibre pull-out

pulverised fuel ash (pfa), 269c, 273r addition to grc, 1e, 3–10 artificial aggregate, 159–67 chemical analysis, 4 pumping methods, 207r

quality control, 207r epoxy resin joints, 237 quartz in MOTEMA-acrylic concrete, 55–7

Ravindrarajah, R.S. 'Casting delay on workability and strength of concrete', 109–113

Ravindrarajah, R. S. and Tam, 'Retempering of plain and superplasticised concretes', 177–82

Rawcliffe river bridge, 226, 229 recycling of concrete, 271–2r

reinforced concrete
Building Code requirements, 60r

Building Code requirements, 60r corrosion protection with epoxy resins, 228

earthquake effects, 273-4r plasticity theories, 137–8r prestressing steel, 207r

slabs, 59–60r torsional behaviour of steel fr beams, 261–7

repair techniques

reinforcement corrosion damage, 61r road surfaces, 255–7 spontaneous disappearance of early

cracks, 199–201 structural reinforced concrete, 204c with polymer materials, 221–2, 227, 228–31, 241–6, 255–7, 258 value judgement, 71e

resin concrete, see polymer concrete resins, 217–22 (see also epoxy resins, polymer concrete)

latex modified concrete, 241–6 test methods, 249–60

ribbed steel fibre reinforcement, 35–7 road surfacing

repairs with epoxy mortars, 255–7 **Rostasy, F. S.** and Hartwich, 'Compressive strength and deformation of steel fibre reinforced concrete under high rate of strain', 21–8

rupture modulus, see modulus of rupture

safety

design for hazard protection, 61r devices in polymer concrete mixer and pourer, 51–2

epoxy resin processing, 259 sandwich structures

epoxy resin mortar facade panels, 258

iron/MOTEMA-acrylic concrete, 57 Scammonden bridge, 227 self-regeneration of cracked concrete, 199–201

set-retarding of concrete, 109–13 shape of fibre, see fibre shape shape of specimen

effect on stress-strain curves, 84, 86–91 Mode II tests, 93–6, 98, 99, 100 resin composition standards, 250–2

Shaw, J. D. N., 'Resins in construction', 217–23

shear bond strength

latex modified concrete, 243, 244 resin composition standard, 250, 251, 252

shear strength

failure of short concrete beam, 44–7 shotcreting, 149e, 204–5c

shrinkage

absence in epoxy resin joints, 236 compensation, 60–1r latex modified concrete, 243, 244 pfa coarse aggregate concrete, 164–6 resin composition standard, 250–2

Sims, F. A., 'Applications of resins in bridge and structural engineering', 225–32

Singh, B. and Majumdar, 'The effect of pfa addition on the properties of grc', 3–10

sisal fibres

bond to cement, 73–9 sisal fr concrete, 11–19 slag products, 137r, 203c, 269c, 273r slip

load-slip relation for oil-saturated concrete, 118-19, 121-2, 124

slump, see workability Somerville College, Oxford, 234, 235, 238

steel fr cement

pull-out processes, 29-37 steel fr concrete, 138r, 149-50e,

204–5c, 268c compressive properties, 183–92 compressive strength at high strain rates, 21–8

inelastic deformation under uniaxial compression, 84–9

in-plane shear fracture, 96–100 lateral confining stresses under com-

pression, 81–2 torsional behaviour of reinforced beams, 261–7

twine reinforced, 15-19

steel mesh reinforced concrete, see ferrocement

stirrup reinforcement

effect on concrete under compression, 183-92

effect on torsional behaviour of steel fr concrete, 261–7

storage of polymer concrete, 53 straight steel fibre reinforcement

effect on compressive strength under high rates of strain, 22–7 interpretation of pull-out tests, 31–2, 33, 35–7

strain rates, high, 21–8, 103–108 stress intensity factor, 39–40, 96 determination, 40–4 polypropylene fr concrete, 97–8

stress–strain characteristics compressive and tensile loading at high strain rates, 104–107 ferrocement under combined bend-

ing and axial stress, 153–7 oil-saturated concrete in pull-out tests, 119, 123

pfa/grc composites, 6, 8

plain concrete under triaxial compression, 83–4, 85, 86

reinforced concrete under compression, 183–92

steel fr and plain concrete under high strain rates, 23–4, 25–7 steel fr concrete under uniaxial com-

steel fr concrete under uniaxial compression, 84–92

styrene-butadiene latex, 219-20, 242 modified concrete, 241-6

sugar factory floors, 255, 256 sulphates

attack on asbestos cement pipes, 169-76

content in pfa–grc composites, 7–8 superplasticiser

effect on workability and compressive strength, 109–13 retempering agent, 177–82

Swarny, R. N., 1e, 71e, 149–50e, 215e swelling, see expansion Sydney Opera House, 234, 235, 237–8

Tam, C. T. and Sri Ravindrarajah, 'Retempering of plain and superplasticised concrete', 177–82

Tanigawa, Y., Kosaka and Hatanaka, 'Lateral confining stresses due to steel fibres in concrete under compression', 81–92

temperature effects, 273r

tensile strength

concrete cracked at an early age, 199–201

concrete under compressive loads at high strain rates, 103–108 effect of shape of steel fibres, 89 MOTEMA-acrylic concrete, 57 pfa coarse aggregate concrete, 162,

pfa/grc composites, 5, 6, 7, 8 resin composition standard, 250, 251, 252

sisal, 76

tension stiffening and toughness of twine reinforced concrete, 13–15, 19 tension tests

at high strain rates, 103–108 compact, 30–7

test methods (see also accelerated

tests, compression tests, tension tests)

bond strength, 115–16 resin compositions, 249–52

thermal properties

lw concrete, 215e resin compositions, 250–2

Tillyer, R. B., 'Resin compositions in the construction industry, development of test methods', 249–52

Tinic, C. and Bruhwiler, 'Effect of compressive loads on the tensile strength of concrete at high strain rates', 103–108

torsion tests

steel fr reinforced concrete beams, 261-7

toughness

fracture, 46

steel fr reinforced concrete beams, 261, 267

tension, 13-15, 19

toughness index, 96-7

steel fr concrete, 98, 99-100

Trent river bridge, 226–7, 229 tropical countries, 137r

twines, 11–12

concrete reinforcement, 12-19

Urn Farm bridge, Leeds, 227, 229, 230

van der Wegen, G. J. L. and Bijen, 'Properties of concrete made with three types of artificial PFA coarse aggregates' 159–67 Walton-upon-Thames swimming pool, 235, 239

waste materials, 215e

water

effect on strength of copper fr cement, 195, 196

retempering agent, 177–82

water-cement ratio

effect on stress–strain curves of plain concrete, 83–4, 86

water reducing agent, see superplasticiser

Watkins, J. and Liu, 'A finite element study of the short beam test specimen under mode II loading', 39–47

Watkins, J., Liu and Barr, 'Mode II fracture of fibre reinforced concrete materials', 93–101

weathering

epoxy resin joints, 236 latex modified concrete, 246 pfa/grc-composites, 6, 7–9

woodpulp fr cements, 73-4

workability

effect of casting delay, 109–13 retempering agents to achieve, 177– 82

Young's modulus pfa coarse aggregate concrete, 162, 164 pfa/grc composites, 5

Zamorowski, W., 'The phenomenon of self-regeneration of concrete', 199– 201